

Lecture Module - Introduction

ME3023 - Measurements in Mechanical Systems

Mechanical Engineering
Tennessee Technological University

Topic 1 - Introduction

Module 1 - Introduction

- Topic 1 - Using Calipers
- Topic 2 - Using Micrometers

Topic 1 - Using Calipers

- Overview
- Components
- Vernier Calipers
- Digital Calipers
- Group Activity

Overview

- A caliper (... a pair of calipers) is a device used to measure the distance between two opposite sides of an object. Text:

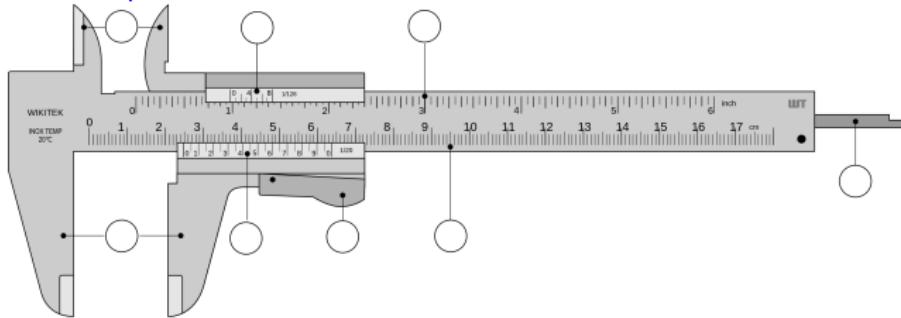
[Wikipedia](#)

- Length, Width, Height
- Inside and Outside Diameter
- Depth

- There is a wide variety of caliper(s). This word means different things in different fields.
 - Engineering and Design
 - Machining and Construction
 - Medical Applications and Others

Components

Text: [Wikipedia](#)



- ① - Outside jaws: used to take external measures of objects
- ② - Inside jaws: used to take internal measures of objects
- ③ - Depth probe: used to measure the depth of objects
- ④ - Main scale (cm)
- ⑤ - Main scale (inch)
- ⑥ - Vernier (cm)
- ⑦ - Vernier (inch)
- ⑧ - Retainer: used to block movable part

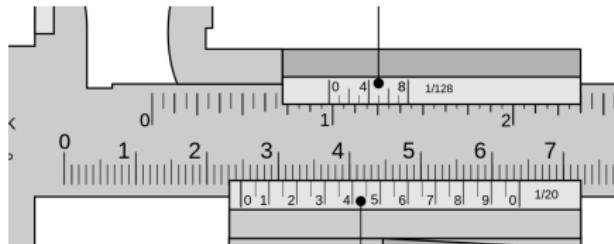
Vernier Calipers

A vernier scale is a visual aid to take an accurate measurement reading between two graduation markings on a linear scale by using mechanical interpolation; thereby increasing resolution and reducing measurement uncertainty by using Vernier acuity to reduce human estimation error.



Digital Calipers

- ① Inspect the jaws. Wipe the jaws with a clean rag or cloth.
- ② Close the jaws around the object gently and avoid deflecting the object. Verify the reading is zero.
- ③ Read the main scale and record the measurement.
- ④ Read the Vernier scale and add to the main scale measurement.



Topic 2 - Using Micrometers

- Overview
- Components
- Vernier Micrometer
- Digital Micrometer

Overview

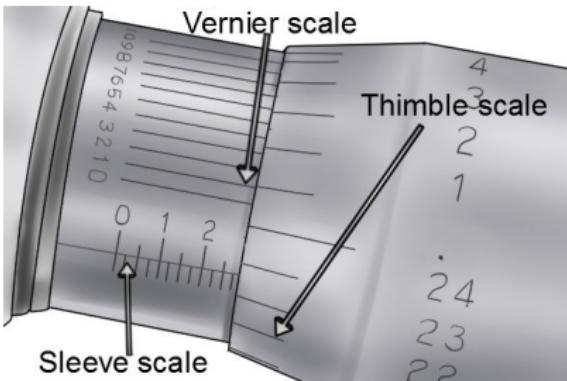
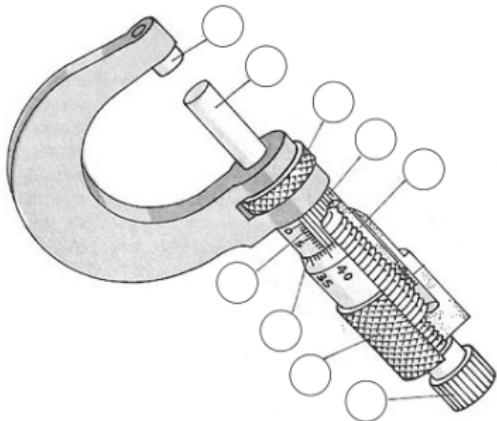
A micrometer, sometimes known as a micrometer screw gauge, is a device incorporating a calibrated screw widely used for accurate measurement of components[1] in mechanical engineering and machining as well as most mechanical trades, along with other metrological instruments such as dial, vernier, and digital calipers.

Text: [Wikipedia](#)

Unlike a pair of Vernier or digital calipers, most micrometers are designed to measure outside dimensions only.

Text: [Theory and Design of Mechanical Measurements, 5th Edition](#)

Components



- ① Anvil
- ② Spindle
- ③ Thimble
- ④ Lock Ring
- ⑤ Sleeve Scale
- ⑥ Thimble Scale
- ⑦ Vernier Scale
- ⑧ Ratchet (Clutch) Knob

Vernier Micrometer

A vernier scale is a visual aid to take an accurate measurement reading between two graduation markings on a linear scale by using mechanical interpolation; thereby increasing resolution and reducing measurement uncertainty by using Vernier acuity to reduce human estimation error. [Wikipedia](#)

Pros

-
-
-

Cons

-
-
-

Digital Micrometer

A digital micrometer contains an embedded processor and user interface to facilitate the measurement process.

Pros

-
-
-

Cons

-
-
-

Make sure to clean the jaws and zero the instrument before you take a measurement. Also, be careful not to press the zero button on accident. On some models this is very easy to do.